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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Colvin, Butler, Korniski

Serial No: 10/709,704 Group Art Unit: 2855

Filed: 24 May 2004 Examiner: McCall, Eric

Title: PORTABLE VEHICLE EXHAUST FLOW SENSOR

Attorney Docket No.: 81100109

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May 14, 2006
Date

David S. Bir (Reg. No. 38,383)

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Commissioner for Patents
P.O. Box 1450
Arlington, VA 22313-1450

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Sir:

Applicants hereby request review of the final rejection in the above-identified application.

No amendments are being filed with this request.

This request is being filed concurrently with a Notice of Appeal.

The review is requested for the reasons stated on the attached sheets of no more than 5 pages.

Reason(s) For Requesting Pre-Appeal Brief Review

The Examiner relies on Weigand (US 5,837,903) in rejecting Applicants' independent claims under 35 USC §102(b). Applicants' claimed invention is directed to an on-board vehicle exhaust flow sensor that uses a screen to create a pressure differential that is measured and used to determine the exhaust flow. Weigand '903 is directed to a laboratory device that uses a Linear Flow Element (LFE) in determining exhaust flow, which, as explained in Applicants' specification and arguments in response to the Office Action and during a telephonic interview, is unsuitable for on-board vehicle applications and clearly distinguishable from a screen as disclosed and claimed by Applicants.

**Does the Linear Flow Element disclosed by Weigand '903 anticipate a screen as disclosed and claimed by Applicants?**

The Examiner relies on US Pat. 5,837,903 to Weigand in rejecting Applicants claims stating that Weigand discloses measuring a pressure difference across a screen (18) as disclosed and claimed by Applicants. Applicants respectfully disagree. Weigand teaches use of a ceramic laminar flow element (LFE) (18) placed within the exhaust stream to create the pressure difference, not a screen as disclosed and claimed by Applicants. As described in Paragraph [0003] of Applicants' disclosure "laminar flow devices are typically too heavy for portable use on a vehicle without additional reinforcement, contribute undesirable thermal capacity to the system, and do not have the desired operating range for use as a portable on-board measuring device. Formation of condensation on the flow measuring devices, especially during cold starts, may also result in measurement errors." As described in Paragraph [0007] of Applicants' disclosure, "use of a thin screen or similar flow restriction element does not significantly increase the thermal capacity of the system and facilitates portability compared to conventional laminar flow measurement devices" such as the ceramic LFE (18) disclosed by Weigand.

The use of a screen according to Applicants' invention also reduces or eliminates condensation that may adversely impact flow measurements. As described in Paragraph [0027] "screen 92 or other flow restriction element is preferably a circular element that extends across a cross-sectional area of tube 80

and includes a plurality of strands or wires arranged in an array with the spacing selected to reduce or eliminate formation of condensation under normal operating conditions, while providing a measurable differential pressure for exhaust flows ranging from engine idle to full throttle." Paragraph [0028] of Applicants' disclosure further describes and quantifies these advantages with reference to one embodiment where: "The relatively thin flow restriction element implemented by a screen resulted in an increase of back pressure of approximately 5.2% which is within the range of normal barometric pressure variation. In addition, formation of condensation was reduced or eliminated so that it did not adversely affect the accuracy of flow measurements."

Applicants' disclosure clearly distinguishes a screen from a conventional ceramic LFE as disclosed by Weigand, which has a considerable longitudinal dimension (with associated weight that makes it generally unsuitable for on-vehicle applications) required to create a laminar flow as known by those of ordinary skill in the art and illustrated in Fig. 1 of Weigand. As described by Applicants, the flow restricting element or screen is formed from a plurality of strands or wires arranged in an array with the spacing selected to reduce or eliminate formation of condensation under normal operating conditions, while providing a measurable differential pressure for exhaust flows ranging from engine idle to full throttle and to minimize increased back pressure. The thickness or longitudinal dimension is relatively thin and based on the screen pattern and size of the wires or strands, which is on the order of 0.035 inches in one embodiment as described in Paragraph [0027]. Furthermore, LFE (18) clearly does not extend across the cross-sectional area (substantially or otherwise) of cylindrical body 12.

In contrast to the Examiner's contention, as shown in Fig. 1 of Weigand, LFE (18) is positioned in the center of cylindrical body 12 and covers only about 50-60% of the cross-sectional area. If LFE (18) extended substantially entirely across the cross-sectional area as disclosed and claimed by Applicants, the resulting back pressure would be significantly higher and likely unacceptable for many applications.

The longitudinal dimension of LFE (18) would also result in formation of condensation under various operating conditions. Weigand uses a heating

element (28) to heat body 12 and LFE (18) to maintain a temperature above the dew point of the exhaust gas to prevent formation of condensation. (See Col. 2, ll. 50-55; Col. 4, ll. 19-38; Col. 7, ll. 60-66; Fig. 7, block 148). "This preheating is necessary to prevent the thermal inertia of the ceramic laminar flowmeter from condensing exhaust gas water which will plug and occlude the capillary tubes of the capillary section and result in inaccurate readings." (Col. 9, ll. 55-58) As described above, Applicants' use of a relatively thin flow restricting element, such as a screen, does not require a heater to reduce or eliminate condensation, does not significantly increase the thermal inertia or capacity of the system, and is light enough to use on-board a vehicle. In contrast, the LFE flowmeter disclosed by Weigand is used with an engine mounted on a test stand where weight, thermal inertia, and preheating of the flowmeter are apparently not considerations (Col. 7, ll. 48-59). It would clearly not be practical for a vehicular application to require heating of the flow element to 150 °C prior to starting the engine as taught by Weigand to avoid formation of condensation.

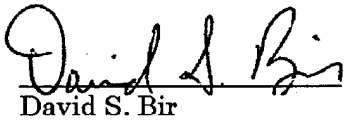
As such, with respect to claims 1, 20, 22, 23, and 32, Weigand does not disclose or suggest measuring a pressure difference upstream and downstream of a screen as disclosed and claimed by Applicants. With respect to claims 12 and 15, Weigand does not disclose or suggest a flow restricting element (or screen) extending substantially entirely across a cross-sectional area of the tube.

With respect to claim 14, the Examiner states that Weigand is deemed to disclose a screen having about six strands per inch in a generally rectangular array as disclosed and claimed. Applicants respectfully disagree. Even if the LFE disclosed by Weigand could be considered a screen, which it is not, Weigand does not suggest sizing of the open area to reduce condensation as taught by Applicants and does not disclose an LFE having about six "strands" (or cells) per inch as the Examiner contends. Rather, Weigand discloses that each parallel tube 20 of the capillary section of the LFE is square in cross section with an open internal area of 0.05 by 0.05 inches (Col. 3, ll. 38-39), significantly smaller than the open area (0.1317 inches) of the six mesh screen taught by Applicants to reduce or eliminate condensation formation while minimizing added back pressure (See Paragraph [0028] for example). Applicants selection of a six mesh screen, or a screen with less than 10 strands per inch (Claim 21) provides

advantages (acceptable backpressure while covering substantially entire cross-section, reduction or elimination of condensation, light weight) that are neither disclosed nor suggested by the LFE taught by Weigand. In contrast, Weigand teaches that LFE 18 is subject to condensation formation and requires a heating element 28 to preheat body 12 and LFE 18 before starting the engine to avoid condensation. As such, LFE 18 clearly does not have the necessary construction as taught by Applicants and claimed in claims 13, 14, and 21.

As described above, Applicants' disclosed and claimed screen and measuring a pressure drop across a screen is clearly patentably distinguishable from the LFE disclosed in Weigand '903. As such Applicants' claims 1, 12-21, 23-27, and 32 include features that are not anticipated by Weigand '903. As such, Applicants respectfully request that the rejection under 35 USC §102(b) be withdrawn. Furthermore, because the rejection of claims under 35 USC §103(a) is also based on Weigand '903 as the primary reference, and the secondary reference(s) fail to disclose or suggest the use of a screen, Applicants request that the rejection of claims under 35 USC §103(a) also be withdrawn.

Respectfully submitted:



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